would seem hardly necessary to attribute the perfect marching in the absence of sound signals to any mutual subconscious force passing betwen the men. Would it not be reasonable to infer that in this case the rhythm is sight-transferred? To be sure, in a long straight column any particular squad would not be able to see far down the line, but in getting the time of the step from those somewhat in advance of them there would seem to be as much likelihood of the slight error having either sign, so that there would be no accumulation in error back through the column, as occurs in the case of establishing the rhythm by means of sound signals at the head of the column. That there is, in the absence of sound signals, a sway and swing absent at other times, may be solely a result of perfect rhythm, rather than a result of any difference in the marching of any one man. It is conceivable that in a column of men every man would be marching with rhythmic step, and with dash and enthusiasm, and yet there would be no satisfactory swing and sway to the column if the men were in slightest amount out of step. Synchronize their movements, and the result becomes immediately rhythmic and inspiring, although each man may be taking the same steps in exactly the same way.

That a marching column accepts audible signals in preference to visual signals in case both exist is, I should suppose, a matter of common knowledge. The writer had occasion to drill on the grass-covered Ellipse at Washington many mornings last summer before the heavy dew had gone. The dominant note caused by marching was not that resulting from the planting of the foot, but rather that from the movement through the heavy wet grass—a sound exactly out of phase with the former which ordinarily, in a small body of men, gives the sound signal for the rhythm. The strenuous West-Pointer who was conducting the drill never seemed to realize why he could not keep the men in step at such times. There was a continual wave of changing of step passing back through the column, in an everlasting but hopeless endeavor to make the step coincide with a signal automatically and inescapably out of phase with it.

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SCIENTIFIC BOOKS

The Elementary Nervous System. By G. H. PARKER. Philadelphia, J. B. Lippincott Co. 1919. Pp. 227, figs. 53.

With characteristic lucidity, Dr. Parker has written the second of the Monographs on Experimental Biology of which Dr. Loeb's "Forced Movements, Tropisms and Animal Conduct" is the first. Limited by the plans already outlined for subsequent volumes of the series to subject matter "drawn almost entirely from the three simpler phyla of the multicellular animals, the sponges, cœlenterates and the ctenophores," this book is nevertheless an illuminating introduction to the more fundamental problems of nervous systems in general. Anatomy and histology are not neglected. The author, however, has attacked the subject frankly as a physiologist, by the method of quantitative experimental analysis that in recent years has been revealing a more and more intimate kinship between biology and the maturer sciences of physics and chemistry. The bibliography at the end of the volume contains one hundred and sixty-six titles, and the author has been exceptionally careful, by frequent references throughout the text, to acknowledge his appreciation of the work of others. Yet, owing to the comprehensiveness of his own researches, he has been able in the development of his theme to review many of his own experiments. In this way, though these reviews are necessarily brief and untechnical, he makes of the reader a co-investigator who shares with him his own keen interest in the problem, his rare skill in devising experiments that are masterfully direct and simple, and who feels the confidence in the results that clear-cut workmanship inevitably inspires.

In an introductory chapter the neuromuscular mechanisms of the higher animals are analyzed into receptors (sense organs), ad-

justors (central nervous organs) and effectors (muscles or other organs that enable the animal to react on the environment). Of these, effectors alone are found in sponges. "They mark the beginnings of the neuromuscular mechanism in that they possess the original and most ancient of its constituents, muscle, around which the remainder of the system is supposed subsequently to have been evolved."

Two chapters are devoted to the sponges, a third to independent effectors in the higher animals, and a fourth to a sluggish type of non-nervous transmission (*neuroid*) that is exhibited by sponges, ctenophores and probably by the ordinary tissues of animals. These four chapters constitute the first of three sections concerned respectively with effector systems, receptor-effector systems, and central nervous organs.

Section two, comprising eight chapters, deals with the neuro-muscular structure of, and nervous transmission in, sea anemones, jellyfishes and hydroids; the nerve net, of which their nervous systems are in large part representative, and which reappears also in the higher animals, *e. g.*, in connection with the musculature of blood vessels and intestine; the diffuse transmission which characterizes the nerve net; and its relation to the appropriation of food and other complex responses.

The single chapter in section three discusses by way of conclusion the relations of the elementary nervous system to the central nervous system of the more complex animals, especially the evolution of that novel element in the system, the central organ or adjustor, which arises in the region between receptor and effector and out of that material which in the elementary system constitutes the nerve net.

General readers as well as special students of science may congratulate themselves on the publication of another book in the growing list by American authors that is making accessible to them in untechnical and attractive form the latest episodes in scientific progress, each with all the authority of a master in his chosen field.

HARRY BEAL TORREY

NOTES ON METEOROLOGY AND CLIMATOLOGY

METEOROLOGY AS A SUBJECT FOR STUDY

The great importance of weather in military operations[2] early made current European weather information a matter of military secrecy, and put a premium on meteorologists. The U. S. Signal Corps met the demand by training about 500 scientific and technical men in meteorology,[3] and the Naval Aviation Service trained about another 100.[4] Meteorology was also introduced in some institutions as part of the prescribed work of the S.A.T.C.,[5] but most of them had planned this work for the second or third term, and so failed to give it.

Thus at the end of the war, in spite of the stimulation, the amount of meteorological instruction given in the United States had changed but little from its pre-war status: in fact, the loss of instructors eliminated meteorology from the list of courses given at a number of institutions. A recent survey of the extent of instruction in meteorology in the colleges and universities of the United States, revealed only 70 (less than a sixth of the number reporting) in which any course in meteorology or climatology were given; though perhaps an additional third of the institutions of higher learning in the country touch on meteorology in more general courses.[6]

Nevertheless, the present demand for meteorological information, particularly for special aeronautical forecasts, is much greater than ever before; and the demand for more detailed forecasts and for longer range ones has become more insistent. Our institutions of higher learning are already beginning to appreciate

[2] See R. DeC. Ward's articles on the influence of weather on military operations: Bibliography in *Monthly Weather Review*, February, 1919, Vol. 47, pp. 84–85.

[3] See *Monthly Weather Review*, December, 1918, Vol. 46, pp. 560–562, and April, 1919, Vol. 47, pp. 210–225.

[4] *Ibid.*, April, 1919, Vol. 47, pp. 225–230.

[5] See the text-book written for this: "Introductory Meteorology," New Haven, 1918, 149 pp.

[6] For further details see *Monthly Weather Review*, March, 1919, Vol. 47, pp. 169–170.